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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/075,123 | 02/12/2002 | Gerardo Bertero | K2000023 | 7295 |

29868 7590 04/29/2004

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| EXAMINER | |
|---|---|
| BERNATZ, KEVIN M | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1773 | |

DATE MAILED: 04/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AS

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/075,123 | BERTERO ET AL. | |
| | Examiner | Art Unit | |
| | Kevin M Bernatz | 1773 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 2-9,13-15 and 17-47 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 2-9,13-15 and 17-47 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. Amendments to claims 2 – 9, 13 - 15, 17 – 21, 27, 33, 35 and 38, cancellation of claims 1, 10 – 12 and 16, and addition of new claims 40 - 49, filed on February 10, 2004, have been entered in the above-identified application.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### *Examiner's Comments*

3. Applicants' invention is directed to fourteen distinct, but related species with several common limitations through-out. To better clarify the different species, the Examiner refers applicants to Table 1, below.

Note [1]: These claims are broken down into: approximately steady state (claim 13), within 95% of steady state (claim 17) and within 90% of steady state (claim 18).

Note [2]: These claims are broken down into: approximately steady state (claim 19), within 95% of steady state (claim 20) and within 90% of steady state (claim 21).

Table 1: Summary of Independently Claimed Species

| ***Apparatus Claims w/ known apparatus limitations*** | Substrate w/ mag/Ru/mag (AF coupled) medium limitations | Hc(dyn) reaches ~SS within 1 rev[1] | Hc(dyn) reaches ~SS within 15 msec[2] | Relative Ku values of upper and lower mag. lyrs | Hc or Hc(dyn) or lower mag. lyr limited |
|---|---|---|---|---|---|
| Claim 13 | YES | YES | | | |
| Claim 17 | YES | YES | | | |
| Claim 18 | YES | YES | | | |
| ***Product Claims*** | | | | | |
| Claim 19 | YES | | YES | | |
| Claim 20 | YES | | YES | | |
| Claim 21 | YES | | YES | | |
| Claim 22 | YES | | | YES | |
| Claim 27 | YES | | | | YES |
| Claim 33 | YES | | | | YES |
| Claim 38 | YES | | | | YES |
| ***Method Claims*** | | | | | |
| Claim 40 | YES | YES | | | |
| Claim 41 | YES | YES | | | |
| Claim 43 | YES | | YES | | |
| Claim 44 | YES | | YES | | |

***Claim Rejections - 35 USC § 102***

4. Claims 2, 9, 13 – 15, 17 – 21 and 40 - 49 are rejected under 35 U.S.C. 102(a) as being anticipated by Acharya et al. (Proc. of 6th Int. Sym. Mag. Mat., Proc. and Dev., Phoenix, Oct. 2000), as evidenced by Tam et al. (U.S. Patent No. 5,412,809).

Regarding claims 13, 17 – 21 and 40 - 45, Acharya et al. disclose a magnetic recording medium/disk comprising a substrate (*Figure 4a*), a lower magnetic layer structure formed over said substrate, an intermediate layer comprising Ru, and an upper magnetic layer structure formed over said intermediate layer, said upper magnetic layer structure being antiferromagnetically coupled to the lower magnetic layer structure (*Pages 5 – 6*).

Regarding the apparatus claims 13, 17 and 18, the claimed apparatus limitations ("a read-write head; and a motor coupled to rotate said magnetic disk") are deemed to necessarily be present in the commercial disk drives disclosed by Acharya et al. (*page 2, section II*) since such limitations are known to be possessed by disk drives inorder for the disk drive to function (*see Tam et al., col. 1, lines 12 – 50 and col. 2, lines 39 – 46*).

Regarding the method claims 40 - 45, the method limitations "rotating a magnetic disk", "applying a write magnetic field to a location on said magnetic disk; and terminating the application of said write magnetic field to said location" are known methods of use limitations and are deemed to necessarily be met by the disclosed experimental methods used by Acharya et al. since Acharya et al. disclose Figures

measuring the read/write properties and provides explicit teaching regarding the write head and its effect on the overwrite properties of the medium (*Figures and Section IV*).

Regarding the limitation of a "magnetic disk containing recorded data" (claims 13, 17 and 18), "data being recorded in said magnetic layer structures" (claims 19, 20 and 21), and "said upper magnetic layer structure comprising a data recording layer" (claims 27, 33 and 38), the Examiner notes that Acharya et al. disclose media wherein the upper magnetic layer structure comprises a data recording layer, thereby meeting all the above limitations (*Section IV and Figures*).

With regard to the limitations regarding the time to reach steady state of the lower magnetic layer upon termination of the application of a write magnetic field to a location on the disk in either one revolution (claims 13, 17, 18 and 40 – 42) or in 15 milliseconds (claims 19 – 21 and 43 – 45), it has been held that where claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established and the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC 102 or on *prima facie* obviousness under 35 USC 103, jointly or alternatively. Therefore, the *prime facie* case can be rebutted by ***evidence*** showing that the prior art products do not necessarily possess the characteristics of the claimed product. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the

same, the applicant has the burden of showing that they are not." *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

In the instant case, many of the embodiments disclosed by Acharya et al. are identical in structure to applicants' claimed substrate/magnetic/Ru/magnetic antiferromagnetically coupled structure. For example, see examples in Figure 5, Figure 6 (especially L1 < 4 nm), Figure 7 (especially for Hc,L1 = 100 Oe), Figure 8 (especially L1 < 4 nm), Figure 9 (especially Ru = 0.6 nm) and Figures 12 and 13 (max S/N examples). Applicants' are reminded that a single embodiment within a claimed range is a *prima facie* anticipation of a claimed range.

Therefore, in addition to the above disclosed limitations, the presently claimed properties of the time for the lower magnetic layer to reach steady state after termination of application of a write magnetic field is deemed to inherently be present in at least several, if not all, of the disclosed Acharya et al. embodiments since the disclosed structures used by Acharya et al. for the media are identical to applicants' claimed structure and there is presently no evidence of record that the disclosed embodiments do not possess the recited functional limitation.

Regarding claims 9 and 14, Acharya et al. disclose additional layers meeting applicants' claimed structural limitations (*Figure 4a*).

Regarding claim 15, Acharya et al. disclose that synthetic ferrimagnetic media comprising antiferromagnetically coupled magnetic layers through Ru spacer layers can comprise two or more lower magnetic "stabilization layers" (*pages 5 – 6*), thereby

meeting applicants' claimed structural limitation of an additional "lowest magnetic layer" and a "second intermediate layer comprising Ru".

Regarding claims 46 – 49, Acharya et al. disclose longitudinal recording in the uppermost magnetic layer of said medium (*Title; Section IV; and Figures*).

***Claim Rejections - 35 USC § 103***

5. Claims 3 – 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Acharya et al. as evidenced by Tam et al. as applied above, and further in view of Doerner et al. (U.S. Patent No. 6,537,684 B1) and Shinohara et al. (U.S. Patent App. No. 2002/0045069 A1).

Acharya et al. is relied upon as described above.

Acharya et al. fail to disclose the alloy composition used in the magnetic layers, other than noting that they are CoCrPtB layers.

However, Doerner et al. and Shinohara et al. teach that the composition of a CoCr magnetic alloy can be varied to effect the magnetic properties and noise characteristics of the medium (*Doerner et al., col. 2, lines 54 – 63; col. 3, lines 45 – 48; col. 4, lines 56 – 65; col. 5, lines 5 – 7 and 29 – 31; and col. 5, line 55 bridging col. 6, line 21; and Shinohara et al., Paragraphs 0071 – 0079 and 0152*). Therefore, the Examiner deems that it would have been obvious to one having ordinary skill in the art to determine an amount of Co, Cr, Pt, Ta, B and/or Nb meeting applicants' claimed composition limitations by optimizing the results effective variable through routine experimentation, especially given the teachings in Doerner et al. and Shinohara et al.

regarding known magnetic alloy compositions for use in antiferromagnetically coupled longitudinal magnetic media. *In re Boesch*, 205 USPQ 215 (CCPA 1980); *In re Geisler*, 116 F. 3d 1465, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *In re Aller*, 220 F.2d, 454, 456, 105 USPQ 233, 235 (CCPA 1955).

6. Claims 22 – 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Acharya et al. as evidenced by Tam et al. as applied above, and further in view of Kikitsu et al. (U.S. Patent App. No. 2001/0051287 A1), Igarashi et al. (U.S. Patent App. No. 2002/0132140 A1) and Acharya et al. (Proc. given at Joint Euro. Mag. Symp., Grenoble, France, 9/2001).

Regarding claims 22 – 26, Acharya et al. is relied upon as described above. Acharya et al. further disclose an upper magnetic layer structure comprising an alloy meeting applicants' claimed Ku limitations and that the Ku is a function of the composition of the magnetic layer (*page 11 and Figure 11*).

Acharya et al. fail to disclose using a lower magnetic layer structure comprising a Ku of less than $0.5 \times 10^6$ erg/cm$^3$ (claims 23).

However, Kikitsu et al. and Igarashi et al. teach that in a dual layered recording medium, it is desired to form the lower magnetic layer with a Ku that is smaller than the upper magnetic layer, preferably less than 70% of the Ku value of the upper magnetic layer, inorder to achieve good resolution and good resistance to thermal fluctuations, as well as the ability to achieve recording with magnetic heads currently in use (*Kikitsu et al., Paragraphs 0219 – 0225 and 0235; and Examples 11 – 17; and Igarashi et al.,*

*Paragraph 0041*). In addition, Acharya et al. (Proc. at Joint Euro. Mag. Symp.) illustrates that using a lower layer with a Ku < 0.5 x $10^6$ erg/$cm^3$ results in a layer with a $K_uV/k_bT$ behavior that is relatively insensitive to thickness.

Therefore, the Examiner deems that it would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the Ku value of the lower magnetic layer structure through routine experimentation, especially given the teaching in Kikitsu et al. and Igarashi et al. regarding the desire to minimize the Ku value of the lower magnetic layer relative to the Ku value of the upper magnetic layer inorder to achieve good resolution, good resistance to thermal fluctuations, as well as the ability to achieve recording with the present magnetic heads. In addition, as taught by Acharya et al. (Proc. at Joint Euro. Mag. Symp.), it would have been obvious to use a lower magnetic layer structure possessing a Ku less than 0.5 x $10^6$ erg/$cm^3$ inorder to produce a lower layer with a $K_uV/K_bT$ behavior that was insensitive to the layer thickness.

7. Claims 27 – 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Acharya et al. as evidenced by Tam et al. as applied above, and further in view of Richter et al. (IEEE Trans. Mag., 34(4), 1998, 1540 – 1542) and Richter et al. (IEEE Trans. Mag., 37(4), 2001, 1441 – 1444).

Acharya et al. is relied upon as described above. Acharya et al. further disclose that the coercivity of the lower layer must be less than the exchange force inorder to enable switching in a positive field, including specific embodiments wherein the

coercivity is less than half the exchange force (*Figure 7a and 8 and page 8*). Finally, Acharya et al. disclose the behavior of the dynamic coercivity with respect to the measurement time in Figure 5, though this is for the entire medium and not for each layer individually (*see also pages 6 – 7*).

Acharya et al. fail to disclose controlling the dynamic coercivity (claims 27 – 32) nor the short-time coercivity (claims 33 – 37) such that they are less than the exchange force (or less than half the exchange force).

However, Richter et al. (both references) teach that it is desired to minimize the short-time coercivity and the dynamic coercivity to insure a small difference between the writing coercivity and the storage (long-time) coercivity inorder avoid writing problems by avoiding the superparamagnetic limit associated with high coercivity values at short times (*Introduction sections of both references and Figures in the 1998 reference*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Acharya et al. to use a lower magnetic layer possessing a relatively flat dynamic coercivity curve as taught by Richter et al. ('2001) since "only *if the dynamic coercivity curve of AFC media* is flatter than that of conventional media, can smaller grains be employed and an SNR gain be realized" (*Introduction*). Specifically, it would have been obvious to one of ordinary skill to minimize the dynamic coercivity and the short-time coercivity values since the long-time coercivity values must be minimized to enable switching in a positive field and by insuring a flat dynamic coercivity curve, the AFC media can avoid the superparamagnetic limit and achieve an improved SNR.

Regarding claim 29, the Examiner notes that the claimed limitation is simply designating which portion of the dynamic coercivity curve is being considered, i.e. the 1 – 10 ns portion of the curve. Since one of ordinary skill in the art would be motivated to produce as flat a curve as possible, given the teachings in Richter et al. and Richter et al. above, the Examiner deems that it would have been obvious to control the dynamic coercivity in this range to meet applicants' relative value limitation for identical reasons as stated above.

8. Claims 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Acharya et al. as evidenced by Tam et al. as applied above, and further in view of Igarashi et al. ('140 A1) and Carey et al. (U.S. Patent App. No. 2003/0022023 A1).

Acharya et al. is relied upon as described above.

Acharya et al. fail to disclose a lower magnetic layer structure comprising a magnetically soft material with intergranular decoupling selected from the group listed in claim 39.

However, the Examiner deems that the CoCrPtB magnetic alloys and magnetically soft materials with intergranular decoupling, i.e. permalloy, are known equivalents in magnetic materials for use in the lower magnetic structure of an antiferromagnetically coupled recording medium. Specifically, Igarashi et al. teach an antiferromagnetically coupled recording medium wherein the lower magnetic layer (*layer 12*) can comprise CoCrPt alloys, as well as known soft magnetic materials "FeNiCo, CoFeTa, NiTa, CoW, CoNb, ... Fe-N" (*Paragraph 0036*). Carey et al. teach that

materials meeting applicants' claimed Markush limitations are known equivalent to the alloys listed by Igarashi et al. (*Paragraph 0024: "In addition to CoFe, other magnetically permeable materials suitable for the FM layers are alloys of CoNiFe, FeCoB, CoCuFe, NiFe, FeAlSi, FeTaN, FeN, FeTaC, CoTaZr, CoFeB, and CoZrNb*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, CoCr alloys and magnetically soft materials with intergranular decoupling meeting applicants' Markush limitation are equivalents in the field of ferromagnetic alloys useable as the lower magnetic layer structure in an antiferromagnetically coupled recording medium, as taught by Igarashi et al. and Carey et al. above. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

***Response to Arguments***

**9. The prior rejection under 35 U.S.C § 102(e) and/or 103(a) – Trindade in view of various references**

The Declaration filed on February 10, 2004 under 37 CFR 1.131 is sufficient to overcome the Trindade et al. reference.

**10. The rejection of claims 2 - 9, 13 – 15 and 17 - 49 under 35 U.S.C § 102(a) and/or 103(a) – Acharya et al. evidenced by Tam et al., alone or in view of various references**

Applicant(s) argue(s) that the limitations in the time to reach steady-state as presently claimed is a product limitation. The examiner agrees.

However, the Examiner notes that the present rejection of record now addresses the product limitations based on the similarity in structure and materials between the prior art and claimed invention. The Examiner notes that presently there is no evidence of record that specific structural or process limitations must be utilized (outside of the prior art disclosed embodiments) to meet the claimed functional limitations.

Regarding claims 22 – 26, applicants also argue that "Acharya teaches directly away from having a low Ku" (*page 20 of response*), that Igarashi et al. "teaches that his lower layer Ku exceeds 0.4 times the upper layer Ku" and that Kikitsu "lacks an upper magnetic layer disposed over an intermediate and lower magnetic layer with antiferromagnetic coupling between the upper and lower magnetic layers". The Examiner respectfully disagrees.

The Examiner notes that "low" is relative and that both Acharya et al. and Kikitsu et al. still disclose materials with greater than $10^5$ erg/cc as useful for the lower magnetic layers. Such a value may be "lower" than the upper magnetic layer, but the Examiner deems that one of ordinary skill in the art would clearly recognize that the teachings of Acharya et al. and Kikitsu et al. are related. The Examiner notes that Kikitsu et al. provides for a non-magnetic layer separating a lower and upper magnetic layer, wherein the magnetic layers can be antiferromagnetically coupled (*Paragraphs 0179 – 0185*) and that Igarashi et al. teach that the lower magnetic layer should have a Ku that is 40 – 70% of the Ku of the upper magnetic layer, therefore clearly teaching that the lower

magnetic layer has a smaller Ku than the upper magnetic layer ( [0.4 – 0.7] x t is less than t when t > 0).

Finally, with regard to claim 27, applicants argue that Richter fails to teach the claimed limitation in the lower magnetic layer coercivity or the relationship between the lower magnetic layer coercivity and the exchange force, and therefore, the rejection of record is improper. The Examiner respectfully disagrees.

Applicant(s) are reminded that "the test for obviousness is not whether features of the secondary reference may be bodily incorporated into the primary reference's structure, nor whether the claimed invention is expressly suggested in any one or all of the references, rather the test is what the combined teachings would have suggested to those of ordinary skill in the art." *Ex parte Martin* 215 USPQ 543, 544 (PO BdPatApp 1981). In the instant case, Acharya et al. provides a clear teaching for controlling the lower magnetic layer coercivity relative to the exchange force inorder to meet applicants' claimed limitations.

***Conclusion***

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on (571) 272-1516. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
April 26, 2004

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